## Abstract of the Disclosure

There is provided an encoder for a wide-band low transmission rate speech signal, which includes: a pre-processing and down-sampling unit, which down-samples a speech signal frame sampled at a high frequency, at a low frequency, and outputs a speech signal frame without DC components; a LPC analysis and ISP quantization unit, which receives the down-sampled speech signal, determines a linear prediction coefficient of the received speech signal frame, converts the linear prediction coefficient into an ISP coefficient, quantizes the converted result, and outputs an index of the ISP coefficient; a residual signal calculation unit, which calculates a residual signal that models an excitation signal of a synthesis filter for the down-sampled speech signal; a random vector generation block which generates a random vector for modeling the excitation signal; a gain calculation block, which calculates a gain for scaling the random vector; and a gain quantization block, which quantizes the gain and creates an index of the gain.